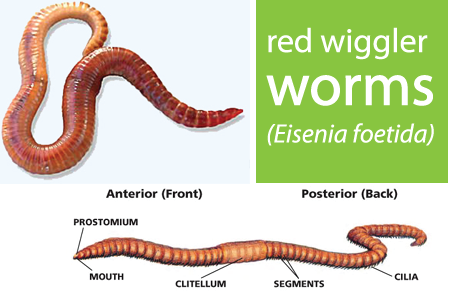
**Title: Red Wiggler Worm Lab**

**Unit 1:** Characteristics of life

**Grade level:** 6th-8thgrade (middle school)

**Time:** 3-5 class periods (45 minutes each)

**Overview**

In the Red Wiggler Worm Lab students will learn about the red wiggler worms they will be using for a classroom composing station. Students will investigate the different environmental conditions that affect the behavior and development of the worms. These environmental conditions include the amount of moisture (wet or dry conditions), the amount of light present in their environment, and the type of surface (sand, gravel, soil or dead leaves). Students will use their results to describe the ideal conditions for vermicomposting in our classroom.

**NOTE**: This lab was adapted from a worksheet on wikisite for Conestoga Valley[[1]](#footnote-1) and from an lab project on sciencebuddies.org.[[2]](#footnote-2)

**Objectives:** Students Will Be Able To….

* Read about the life cycle and habitat of a red wiggler worm (*Eisenia fetida*) and discuss the different environmental stimuli for worms to grow and reproduce in a vermicomposting bin
* Design an experiment to test the different environmental stimuli needed for red wigglers worms to grow and reproduce.

**NYS Living Environment Standards**

* **STANDARD 1:**  Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.
  + Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing and creative process.

**Danielson Framework Competencies**

* Domain 3: Instruction
  + Component 3b: Using Questioning and Discussion Techniques

**Day 1 – Introduction to Red Wiggler Worms**

**HOOK**: Why are worms important to human life and all life on this planet?

Video: <https://www.youtube.com/watch?v=uFKaD6NFjDQ>

***Activity 1: Article on Red Wiggler Worms***

* Students will read an article about the characteristics, habitat and nutrition of a red wiggler worm.
* “[About Red Wiggler](http://redwigglersupply.ca/worm-facts/)” article adapted from the Red Wiggler Supply Company[[3]](#footnote-3)

**Background Questions**

1. Explain why in the article the red wiggler worm is called a “hardy” species.
2. What do red wiggler worms eat?
3. Why are red worms called “epigeic” worms?

**Possible Experiment Questions**

For each experiment write a hypothesis (prediction) using information from the article.

A) Do red wiggler worms prefer wet or dry conditions? Explain your choice using evidence from the article.

B) Do red wiggler worms prefer light of dark environments? Explain your choice using evidence from the article.

C) Which surface type would red wigglers prefer sand, gravel, soil or dead leaves? Explain your choice using evidence from the article.

***Turn-and-Talk***

* Students will share their responses to the Experiment Question in their groups.
* Each group will select a representative to share out the Experiment Question they are most interested investigating in class and their hypothesis to the question.

***Activity 2: Group Experiment Set-up***

* Each group will receive the instructions for how to use the scientific method to complete their lab. They will work together to identify the variables in their experiment question, o writ step-by-step procedures for how to conduct their experiment and draw a set up of their experimental design.

**Day 2: Continue to set-up and conduct experiment**

* Groups who have completed the variables, procedures and drawing of set up will receive their materials.
* Have following safety reminders on the board.

**Reminders**

*1) Make sure to wear gloves at all time.*

*2) Set up your experiment and place the worms in the tray carefully*

*3) The worms cannot be on the tables or floor*

*4) Treat the worms with kindness and dignity as a fellow living thing*

*NOTE: Worms are great test subject and we need them for future experiments and composting.*

**Day 3: Data Collection and Conclusion**

* Students will look at their trays and see the environmental conditions the red wiggler worms preferred by counting the number of worms that moved to one particular side in the tray.

**Experiment Questions and Expected Results**

***A) Do red wiggler worms prefer wet or dry conditions?***

*Expected results*: Worms should move to he wet paper towel

***B) Do red wiggler worms prefer light of dark environments?***

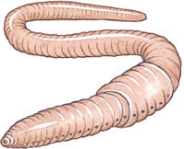
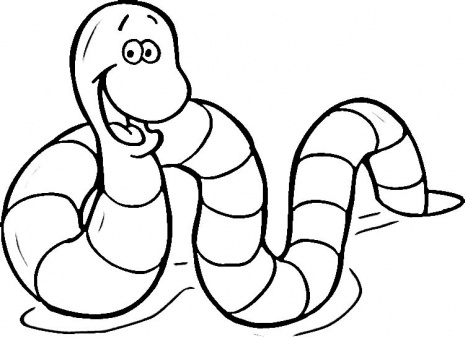
*Expected results:* Worms should move away from the flashlight

***C) Which surface type would red wigglers prefer sand, gravel, soil or dead leaves?***

*Expected results:* Worms should move towards the dead leaves

**Assessment: Formal Lab Rubric**

* Students will use their formal lab rubric to re-write or type all the parts of their investigation.

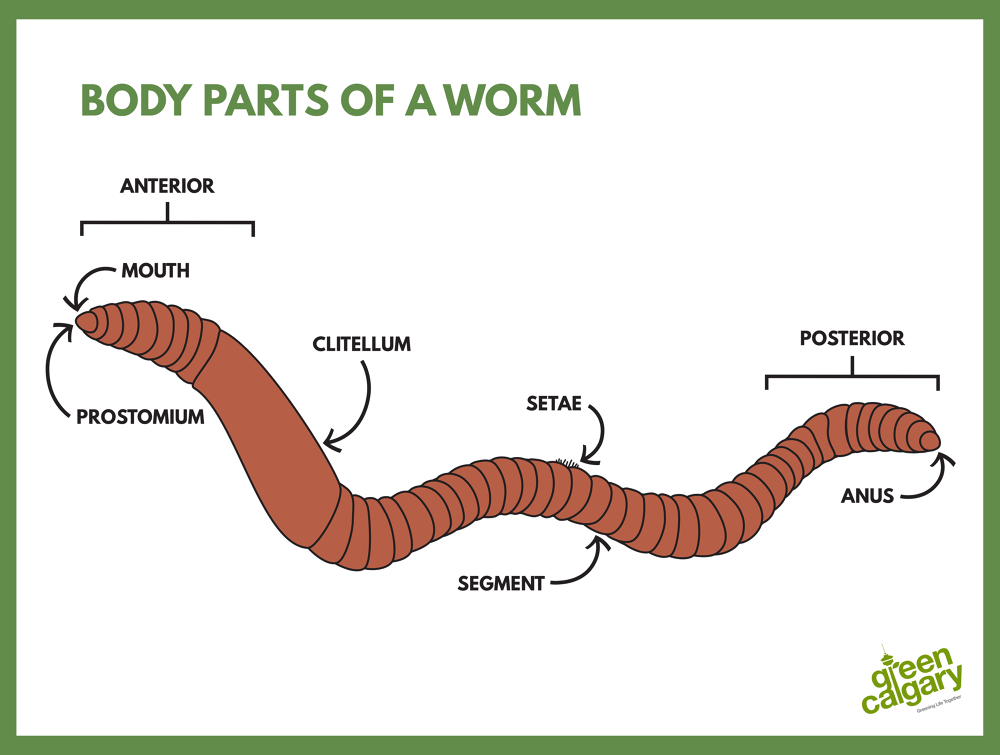
Red Wiggler Worm (EISENIA FETIDA)

**Directions: Complete this laboratory using the *Scientific Method*!**

Step 1: Introduction

**Background Info**

**About all Earthworms**

******Earthworms are segmented worms that belong to ***phylum Annelida*** (which means “little rings”). Around the middle of the worm is a thickened segment encircling the body called the ***clitellum***, which is used in reproduction. Each segment contains tiny bristles called ***setae*** that help the worms hold on to the soil. The setae, along with the muscles along the body wall, are also used to help the worm move. Earthworms have a mouth on their ***anterior*** (front) end and an anus on their ***posterior*** (rear) end. These worms actually eat the soil they live in and extract the bits of plants and animal materials in the soil (detritivore). As the worm digests the decaying organic matter it eats, it excretes the remains back into the soil. The excretions (earthworm poop) are called ***castings.*** *Earthworms* have a ***gizzard*** in their digestive system that helps to grind up the food. They have blood vessels and five structures called, ***aortic arches***, that help pump blood. Worms, however, do not have lungs. They exchange gases through their skin (***diffusion***). That is why it is important for worms to keep the skin *moist at all times.*

**About Red Wigglers**

Red Wigglers (Eisenia species) is most commonly used for vermicomposting. This species of worm is also known as the  “red wiggler”, “red wriggler”, “red worm”, “tiger worm” or “brandling worm”.

**Life Cycle:**The worms hatch from cocoons and mature in about 30 days. Each worm has both male and female organs, but they do mate with other each other. They can produce about two cocoons per week and will lay them near the soil surface. When soil conditions are favorable, or after around 20 days, about three worms hatch from each cocoon. The average life span of the worm is almost two years.  Under favorable conditions, red wiggler worms will reproduce quickly. The population of worms can double every three months.

Red wigglers are especially *hardy* because they can tolerate a wider temperature range than many other types of earthworms. The survival range is zero – 35 degrees Celsius (32 – 95 degrees Farenheit). An optimal temperature is C 25 degrees (75 degrees Farenheit). The ideal moisture content of their habitat is 80 percent, although they will tolerate a wide range of conditions. Cocoons will survive more extreme conditions than the worms.

**Feeding habits:** Red Wigglers are **epigeic**, which means that they feed on the surface, unlike the common gardening worms which burrow in the ground and feed on soil.  When kept in moist bedding with food scraps, a pound of worms consumes up to 1/2 pound of food scraps per day. Food scraps that worms will break down easily include fruit, vegetables, bread, rice, pasta, tea bags, and coffee grounds. They also feed on the bedding (shredded cardboard, newspaper, leaves, etc.). The composting process is termed “mesophilic” which means it is a combination of microbial activity in the soil and earthworms gut along with aerobic decomposition as a result of earthworms activity. The worm composting process produces castings that are excellent for growing plants

**Background Questions**

1. Explain why in the article the red wiggler worm is called a “hardy” species.

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1. What do red wiggler worms eat?

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1. Why are red worms called “epigeic” worms?

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**Experiment Questions and Hypothesis:**

For each experiment write a ***hypothesis*** *(prediction)* using information from the article.

**A) Do red wiggler worms prefer wet or dry conditions? Explain your choice using evidence from the article.**

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**B) Do red wiggler worms prefer light of dark environments? Explain your choice using evidence from the article.**

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**C) Which surface type would red wigglers prefer sand, gravel, soil or dead leaves? Explain your choice using evidence from the article.**

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Step 2: Methods

In this lab, you will practice the skill of observation and data collection to learn more about earthworms. To conduct a successful experiment you must go through three steps.

1. You must gather materials
2. You must write a detailed procedure
3. You must record all data in an organized way

Materials

|  |  |  |
| --- | --- | --- |
| **A) For Dry/ Wet** | **B) For Light/Dark** | **C) Types of Surface** |
| 1. Live earthworms 2. Water 3. Aluminum Tray 4. Eye dropper – to keep earthworm moist 5. Paper towels 6. Timer | 1. Live earthworms 2. Water 3. Eye dropper – to keep earthworm moist 4. Aluminum Tray 5. A flashlight 6. Cardboard 7. Timer | 1. Live earthworms 2. Sand 3. Gravel 4. Soil 5. Dead leaves (crumbled) 6. Eye dropper – to keep earthworm moist 7. Aluminum Tray 8. Timer |

**NOTE:** You must have your procedures completed before receiving the materials.

**Procedure**

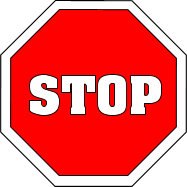
You must write out a **complete and detailed** procedure for your experiment question.

**Your procedure should include how the materials are used, the amounts, at least 2 trials, and detailed instructions on how to setup/ complete the lab.**\*\*\*

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**Sketch of the set up with materials:**

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**STOP! If you have completed your procedures and sketch, raise your hand for teacher approval and experiment materials.**

**Teacher Approval: \_\_\_\_\_\_\_\_\_\_\_\_**

Step 3: Data

\*\*\*You must repeat your experiment at least 2 times. \*\*\*

|  |  |
| --- | --- |
| Trial # | Observations  *Which environment did the worm move toward?*  Record the number of worms in each environmental condition |
| 1 |  |
| 2 |  |
| 3 |  |



C:\Documents and Settings\erika_styer\Local Settings\Temporary Internet Files\Content.IE5\VEGYWYLH\MC900057341[1].wmfCLEAN UP (wash all equipment and hands)

MAKE SURE TO PLACE YOUR WORM IN THE DESIGNATED AREA.

Step 4: Results

Create a graph illustrating the observations

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Step 5: Analysis/Conclusion

Answer these questions based on your experiment:

1. Which environment(s) did the worms prefer? Use evidence from your Data in Step 4 to support your answer.

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1. Did the worms’ behavior support your hypothesis? Explain why or why not.

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1. Use what you know about earthworms to explain how their response to moisture or light would help them survive.

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**Formal Lab Report Rubric**

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| --- | --- | --- | --- | --- | --- | --- |
| **Criteria** | **4**  **Well Developed** | **3**  **Proficient** | **2**  **Developing** | **1**  **Insufficient** | **Level** | **Weighted**  **Score** |
| **Introduction**  - Experiment Q  - Hypothesis  -Background Info | The purpose of the lab is clearly stated by including  **details on the background info and vocab**.  Hypothesis **fully** explained. (variables fully identified and described)  *\*6th/7th must use state independent and dependent variable* | The purpose of the lab is adequately stated by including **some** background info. and vocab.  Hypothesis with **some** explanation. (variables are identified and/or lacks reasoning) | The purpose is somewhat stated by including **some** **necessary** background info and vocab.  Hypothesis with **no clear  explanation** (some variables identified) | Does not explain the purpose of the lab. **No background info or vocab**.  Hypothesis **not testable.** (variables not clearly identified) |  | \_\_\_\_\_\_\_\_  20 |
| **Methods**  - Materials  - Procedures | Fully explores all relevant safety considerations.  List all of materials  **detailed and numbered** steps of how to conduct the experiment. Includes appropriate and precise units | **Adequately** describes how the experiment was performed. Includes important materials used and the procedure followed. **Mostly written so that the experiment can be repeated.** | **Somewhat** describes how the experiment was performed. Includes some materials used and a skeletal procedure. **Somewhat written so that the experiment to be repeated.** | **Does not adequately** describe how the experiment was performed. L**acks most materials.** Experiment cannot be repeated. |  | \_\_\_\_\_\_\_\_  10 |
| **Data** | **Raw data of results** (without interpretation)  **Neatly labeled** and organized in a table.  All observations and calculations shown, with units. | Data and results organized in clear tables, charts, and graphs. Most calculations shown, with units. | Some data and results in tables, charts, and graphs. Some calculations shown, with some units. | Tables, charts, and graphs do not show data and results.  Calculations not shown. |  | \_\_\_\_\_\_\_\_  20 |
| **Results** | All data and results organized in **clear and fully labeled** tables, charts, and graphs. | Clearly and effectively reports most data collected during the experiment with adequate organization. | Reports most data collected during the experiment with some organization. Missing some data. | Report is missing large amounts of data and is very unorganized. |  | \_\_\_\_\_\_\_\_  20 |
| **Analysis/**  **Conclusion** | Claims a precise and well-supported conclusion that responds to the purpose of the lab. Fully summarizes and explains the meaning of data and results, with some examples. Explains relationship to hypothesis.  Clear explains whether the data support or rejects the hypothesis | Claims a conclusion based on data and results that ties to the purpose of the lab.  Adequately summarizes and explains the meaning of the data and results. Hypothesis tied to results. | Makes claims and reaches conclusions minimally based on data and results.  Somewhat summarizes and explains the meaning of the data and results with no concrete examples. Indirectly or barely refers to hypothesis. | Conclusion and claims do not relate to data and results.  Does not summarize and/or explain data and results. Does not use examples of observations; generalizes without support. |  | \_\_\_\_\_\_\_\_  20 |
| **Mechanics & Grammar** | Exemplary control over grammar, usage and mechanics. | Adequate  control over grammar, usage and mechanics and errors do not interfere with communication. | Limited control over grammar, usage, and mechanics and errors interfere with communication. | Fails to follow rules of grammar, usage and mechanics, and errors seriously interfere with communication. |  | \_\_\_\_\_\_\_\_  10 |

**Total Score \_\_\_\_\_\_\_**

**Comments: 100**

1. Source: hess.wiki.conestogavalley.org/file/view/Earthworm+Lab.doc [↑](#footnote-ref-1)
2. Source: https://www.sciencebuddies.org/science-fair-projects/project\_ideas/Zoo\_p061.shtml#materials [↑](#footnote-ref-2)
3. Source: (http://redwigglersupply.ca/worm-facts/) [↑](#footnote-ref-3)